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CURRENT SERIAL RECORDS

# Research Note

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USDA Forest Service  
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## REVISED MARSH FUNNEL TABLE FOR MEASURING VISCOSITY OF FIRE RETARDANTS

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### ABSTRACT

*This Note publishes data on  
new retardants now in use.*

About 3 years ago the Marsh Funnel was modified so that the viscosity of all currently used forest fire retardants could be determined in the field. The data were obtained by comparing viscosity from the Brookfield Viscometer with the flow-through time for the Marsh Funnel; thus "Marsh Funnel time" serves as an inexpensive criterion of actual viscosity.<sup>2 3</sup>

The revised table published here includes only products currently used. Newest of these is Phos-Chek 202 X/A.

The Marsh Funnel Packet is still available. It contains the table, instructions for converting a Marsh Funnel, and a list of commercial sources. Separate tables and the Packet can be ordered from Northern Forest Fire Laboratory, Intermountain Forest and Range Experiment Station, Drawer 7, Missoula, Montana 59801.

<sup>1</sup>Stationed at Northern Forest Fire Laboratory, Missoula, Montana.

<sup>2</sup>George, Charles W., and Charles E. Hardy. Fire retardant viscosity measured by modified Marsh Funnel. U.S. Forest Serv. Res. Note INT-41, 4 pp., illus. 1966.

<sup>3</sup>George, Charles W., and Charles E. Hardy. Fire retardant viscosity measured by modified Marsh Funnel. Fire Control Notes 28(4): 13-14, illus. 1967.



MARSH FUNNEL TIME--FIRE RETARDANT VISCOSITY RELATIONS<sup>1</sup>

Reviewed April 1969

|  |      | Fire retardant material |                  |       |       |       |               |       |
|--|------|-------------------------|------------------|-------|-------|-------|---------------|-------|
|  |      | Phos-Chek               |                  |       |       |       |               |       |
|  |      | Gelgard M               |                  |       |       |       |               |       |
|  |      | 202 202 X/A 259         |                  |       |       |       | Fire-Trol 100 |       |
| Time for 1 quart to flow through funnel <sup>a</sup> |      | Large                   | Small            | Large | Large | Small | Large         | Small |
|  |      | tip <sup>a</sup>        | tip <sup>a</sup> | tip   | tip   | tip   | tip           | tip   |
| Min.   | Sec. | Centipoise              |                  |       |       |       |               |       |
| 0  | 15   |                         |                  |       |       |       | 930           |       |
| 0  | 20   |                         |                  |       | 557   |       | 1530          |       |
| 0  | 25   |                         |                  |       | 767   |       | 1900          |       |
| 0  | 30   |                         |                  |       | 966   | 5     | 2140          |       |
| 0  | 35   |                         |                  |       |       |       | 2330          |       |
| 0  | 40   |                         |                  | 540   | 1155  |       | 2480          | 920   |
| 0  | 45   |                         |                  | 680   | 1334  | 20    |               | 1110  |
| 0  | 50   |                         |                  | 800   | 1502  | 66    |               | 1250  |
| 0  | 55   |                         |                  | 900   | 1659  | 89    |               | 1370  |
| 1  | 00   |                         |                  | 1000  | 1806  | 112   |               | 1460  |
|  |      |                         |                  |       | 1942  | 136   |               |       |
| 1  | 05   | 520                     |                  |       |       |       |               |       |
| 1  | 10   | 550                     |                  |       |       |       |               |       |
| 1  | 15   |                         |                  | 1080  | 2067  | 159   | 2840          | 1540  |
| 1  | 20   |                         | 210              | 1150  | 2183  | 182   | 2880          | 1610  |
| 1  | 25   |                         | 230              | 1210  | 2287  | 205   | 2900          | 1670  |
| 1  | 30   |                         | 250              | 1265  | 2381  | 228   | 2920          | 1720  |
| 1  | 35   |                         | 265              | 1320  | 2465  | 251   | 2930          | 1770  |
| 1  | 40   |                         | 280              | 1380  | 2538  | 274   | 2940          | 1810  |
| 1  | 45   |                         |                  |       |       |       |               |       |
| 1  | 50   |                         |                  |       |       |       |               |       |
| 1  | 55   |                         |                  |       |       |       |               |       |
| 2  | 00   |                         |                  |       |       |       |               |       |
| 2  | 05   | 720                     | 300              | 1420  |       | 297   | 2950          | 1840  |
| 2  | 10   | 740                     | 315              | 1470  |       | 320   | 2960          | 1870  |
| 2  | 15   | 760                     | 330              | 1520  |       | 343   |               | 1900  |
| 2  | 20   | 780                     | 342              | 1560  |       | 367   |               | 1920  |
| 2  | 25   | 800                     | 355              | 1600  |       | 390   |               | 1940  |
| 2  | 30   | 820                     | 370              | 1640  |       | 413   |               | 1960  |
| 2  | 35   |                         |                  |       |       |       |               |       |
| 2  | 40   |                         |                  |       |       |       |               |       |
| 2  | 45   |                         |                  |       |       |       |               |       |
| 2  | 50   |                         |                  |       |       |       |               |       |
| 2  | 55   |                         |                  |       |       |       |               |       |
| 3  | 00   |                         |                  |       |       |       |               |       |
| 3  | 05   | 865                     | 410              | 1755  |       |       |               |       |
| 3  | 10   | 908                     | 442              | 1855  |       |       |               |       |
| 3  | 15   | 945                     | 477              | 1935  |       |       |               |       |
| 3  | 20   | 980                     | 508              | 2010  |       |       |               |       |
| 3  | 25   |                         |                  |       |       |       |               |       |
| 3  | 30   |                         |                  |       |       |       |               |       |
| 3  | 35   |                         |                  |       |       |       |               |       |
| 3  | 40   |                         |                  |       |       |       |               |       |
| 3  | 45   |                         |                  |       |       |       |               |       |
| 3  | 50   |                         |                  |       |       |       |               |       |
| 3  | 55   |                         |                  |       |       |       |               |       |
| 4  | 00   |                         |                  |       |       |       |               |       |
| 4  | 05   | 1014                    | 537              |       |       |       |               |       |
| 4  | 10   | 1045                    | 564              |       |       |       |               |       |
| 4  | 15   | 1072                    | 591              |       |       |       |               |       |
| 4  | 20   | 1098                    | 616              |       |       |       |               |       |
| 4  | 25   |                         |                  |       |       |       |               |       |
| 4  | 30   |                         |                  |       |       |       |               |       |
| 4  | 35   |                         |                  |       |       |       |               |       |
| 4  | 40   |                         |                  |       |       |       |               |       |
| 4  | 45   |                         |                  |       |       |       |               |       |
| 4  | 50   |                         |                  |       |       |       |               |       |
| 4  | 55   |                         |                  |       |       |       |               |       |
| 5  | 00   |                         |                  |       |       |       |               |       |
| 5  | 05   | 1123                    |                  |       |       |       |               |       |
| 5  | 10   | 1147                    |                  |       |       |       |               |       |
| 5  | 15   | 1171                    |                  |       |       |       |               |       |
| 5  | 20   | 1188                    |                  |       |       |       |               |       |
| 5  | 25   |                         |                  |       |       |       |               |       |
| 5  | 30   |                         |                  |       |       |       |               |       |
| 5  | 35   |                         |                  |       |       |       |               |       |
| 5  | 40   |                         |                  |       |       |       |               |       |
| 5  | 45   |                         |                  |       |       |       |               |       |
| 5  | 50   |                         |                  |       |       |       |               |       |
| 5  | 55   |                         |                  |       |       |       |               |       |
| 6  | 00   |                         |                  |       |       |       |               |       |
| 6  | 05   |                         |                  |       |       |       |               |       |
| 6  | 10   |                         |                  |       |       |       |               |       |
| 6  | 15   |                         |                  |       |       |       |               |       |
| 6  | 20   |                         |                  |       |       |       |               |       |
| 6  | 25   |                         |                  |       |       |       |               |       |
| 6  | 30   |                         |                  |       |       |       |               |       |
| 6  | 35   |                         |                  |       |       |       |               |       |
| 6  | 40   |                         |                  |       |       |       |               |       |
| 6  | 45   |                         |                  |       |       |       |               |       |
| 6  | 50   |                         |                  |       |       |       |               |       |
| 6  | 55   |                         |                  |       |       |       |               |       |
| 7  | 00   |                         |                  |       |       |       |               |       |
| 7  | 05   |                         |                  |       |       |       |               |       |
| 7  | 10   |                         |                  |       |       |       |               |       |
| 7  | 15   |                         |                  |       |       |       |               |       |
| 7  | 20   |                         |                  |       |       |       |               |       |
| 7  | 25   |                         |                  |       |       |       |               |       |
| 7  | 30   |                         |                  |       |       |       |               |       |
| 7  | 35   |                         |                  |       |       |       |               |       |
| 7  | 40   |                         |                  |       |       |       |               |       |
| 7  | 45   |                         |                  |       |       |       |               |       |
| 7  | 50   |                         |                  |       |       |       |               |       |
| 7  | 55   |                         |                  |       |       |       |               |       |
| 8  | 00   |                         |                  |       |       |       |               |       |
| 8  | 05   |                         |                  |       |       |       |               |       |
| 8  | 10   |                         |                  |       |       |       |               |       |
| 8  | 15   |                         |                  |       |       |       |               |       |
| 8  | 20   |                         |                  |       |       |       |               |       |
| 8  | 25   |                         |                  |       |       |       |               |       |
| 8  | 30   |                         |                  |       |       |       |               |       |
| 8  | 35   |                         |                  |       |       |       |               |       |
| 8  | 40   |                         |                  |       |       |       |               |       |
| 8  | 45   |                         |                  |       |       |       |               |       |
| 8  | 50   |                         |                  |       |       |       |               |       |
| 8  | 55   |                         |                  |       |       |       |               |       |
| 9  | 00   |                         |                  |       |       |       |               |       |
| 9  | 05   |                         |                  |       |       |       |               |       |
| 9  | 10   |                         |                  |       |       |       |               |       |
| 9  | 15   |                         |                  |       |       |       |               |       |
| 9  | 20   |                         |                  |       |       |       |               |       |
| 9  | 25   |                         |                  |       |       |       |               |       |
| 9  | 30   |                         |                  |       |       |       |               |       |
| 9  | 35   |                         |                  |       |       |       |               |       |
| 9  | 40   |                         |                  |       |       |       |               |       |
| 9  | 45   |                         |                  |       |       |       |               |       |
| 9  | 50   |                         |                  |       |       |       |               |       |
| 9  | 55   |                         |                  |       |       |       |               |       |
| 10   | 00   |                         |                  |       |       |       |               |       |
| 10   | 05   |                         |                  |       |       |       |               |       |
| 10   | 10   |                         |                  |       |       |       |               |       |
| 10   | 15   |                         |                  |       |       |       |               |       |
| 10   | 20   |                         |                  |       |       |       |               |       |
| 10   | 25   |                         |                  |       |       |       |               |       |
| 10   | 30   |                         |                  |       |       |       |               |       |
| 10   | 35   |                         |                  |       |       |       |               |       |
| 10   | 40   |                         |                  |       |       |       |               |       |
| 10   | 45   |                         |                  |       |       |       |               |       |
| 10   | 50   |                         |                  |       |       |       |               |       |
| 10   | 55   |                         |                  |       |       |       |               |       |
| 11   | 00   |                         |                  |       |       |       |               |       |
| 11   | 05   |                         |                  |       |       |       |               |       |
| 11   | 10   |                         |                  |       |       |       |               |       |
| 11   | 15   |                         |                  |       |       |       |               |       |
| 11   | 20   |                         |                  |       |       |       |               |       |
| 11   | 25   |                         |                  |       |       |       |               |       |
| 11   | 30   |                         |                  |       |       |       |               |       |
| 11   | 35   |                         |                  |       |       |       |               |       |
| 11   | 40   |                         |                  |       |       |       |               |       |
| 11   | 45   |                         |                  |       |       |       |               |       |
| 11   | 50   |                         |                  |       |       |       |               |       |
| 11   | 55   |                         |                  |       |       |       |               |       |
| 12   | 00   |                         |                  |       |       |       |               |       |
| 12   | 05   |                         |                  |       |       |       |               |       |
| 12   | 10   |                         |                  |       |       |       |               |       |
| 12   | 15   |                         |                  |       |       |       |               |       |
| 12   | 20   |                         |                  |       |       |       |               |       |
| 12   | 25   |                         |                  |       |       |       |               |       |
| 12   | 30   |                         |                  |       |       |       |               |       |
| 12   | 35   |                         |                  |       |       |       |               |       |
| 12   | 40   |                         |                  |       |       |       |               |       |
| 12   | 45   |                         |                  |       |       |       |               |       |
| 12   | 50   |                         |                  |       |       |       |               |       |
| 12   | 55   |                         |                  |       |       |       |               |       |
| 13   | 00   |                         |                  |       |       |       |               |       |
| 13   | 05   |                         |                  |       |       |       |               |       |
| 13   | 10   |                         |                  |       |       |       |               |       |
| 13   | 15   |                         |                  |       |       |       |               |       |
| 13   | 20   |                         |                  |       |       |       |               |       |
| 13   | 25   |                         |                  |       |       |       |               |       |
| 13   | 30   |                         |                  |       |       |       |               |       |
| 13   | 35   |                         |                  |       |       |       |               |       |
| 13   | 40   |                         |                  |       |       |       |               |       |
| 13   | 45   |                         |                  |       |       |       |               |       |
| 13   | 50   |                         |                  |       |       |       |               |       |
| 13   | 55   |                         |                  |       |       |       |               |       |
| 14   | 00   |                         |                  |       |       |       |               |       |
| 14   | 05   |                         |                  |       |       |       |               |       |
| 14   | 10   |                         |                  |       |       |       |               |       |
| 14   | 15   |                         |                  |       |       |       |               |       |
| 14   | 20   |                         |                  |       |       |       |               |       |
| 14   | 25   |                         |                  |       |       |       |               |       |
| 14   | 30   |                         |                  |       |       |       |               |       |
| 14   | 35   |                         |                  |       |       |       |               |       |
| 14   | 40   |                         |                  |       |       |       |               |       |
| 14   | 45   |                         |                  |       |       |       |               |       |
| 14   | 50   |                         |                  |       |       |       |               |       |
| 14   | 55   |                         |                  |       |       |       |               |       |
| 15   | 00   |                         |                  |       |       |       |               |       |
| 15   | 05   |                         |                  |       |       |       |               |       |
| 15   | 10   |                         |                  |       |       |       |               |       |
| 15   | 15   |                         |                  |       |       |       |               |       |
| 15   | 20   |                         |                  |       |       |       |               |       |
| 15   | 25   |                         |                  |       |       |       |               |       |
| 15   | 30   |                         |                  |       |       |       |               |       |
| 15   | 35   |                         |                  |       |       |       |               |       |
| 15   | 40   |                         |                  |       |       |       |               |       |
| 15   | 45   |                         |                  |       |       |       |               |       |
| 15   | 50   |                         |                  |       |       |       |               |       |
| 15   | 55   |                         |                  |       |       |       |               |       |
| 16   | 00   |                         |                  |       |       |       |               |       |
| 16   | 05   |                         |                  |       |       |       |               |       |
| 16   | 10   |                         |                  |       |       |       |               |       |
| 16   | 15   |                         |                  |       |       |       |               |       |
| 16   | 20   |                         |                  |       |       |       |               |       |
| 16   | 25   |                         |                  |       |       |       |               |       |
| 16   | 30   |                         |                  |       |       |       |               |       |
| 16   | 35   |                         |                  |       |       |       |               |       |
| 16   | 40   |                         |                  |       |       |       |               |       |
| 16   | 45   |                         |                  |       |       |       |               |       |
| 16   | 50   |                         |                  |       |       |       |               |       |
| 16   | 55   |                         |                  |       |       |       |               |       |
| 17   | 00   |                         |                  |       |       |       |               |       |
| 17   | 05   |                         |                  |       |       |       |               |       |
| 17   | 10   |                         |                  |       |       |       |               |       |
| 17   | 15   |                         |                  |       |       |       |               |       |
| 17   | 20   |                         |                  |       |       |       |               |       |
| 17   | 25   |                         |                  |       |       |       |               |       |
| 17   | 30   |                         |                  |       |       |       |               |       |
| 17   | 35   |                         |                  |       |       |       |               |       |
| 17   | 40   |                         |                  |       |       |       |               |       |
| 17   | 45   |                         |                  |       |       |       |               |       |
| 17   | 50   |                         |                  |       |       |       |               |       |
| 17   | 55   |                         |                  |       |       |       |               |       |
| 18   | 00   |                         |                  |       |       |       |               |       |
| 18   | 05   |                         |                  |       |       |       |               |       |
| 18   | 10   |                         |                  |       |       |       |               |       |
| 18   | 15   |                         |                  |       |       |       |               |       |
| 18   | 20   |                         |                  |       |       |       |               |       |
| 18   | 25   |                         |                  |       |       |       |               |       |
| 18   | 30   |                         |                  |       |       |       |               |       |
| 18   | 35   |                         |                  |       |       |       |               |       |
| 18   | 40   |                         |                  |       |       |       |               |       |
| 18   | 45   |                         |                  |       |       |       |               |       |
| 18   | 50   |                         |                  |       |       |       |               |       |
| 18   | 55   |                         |                  |       |       |       |               |       |
| 19   | 00   |                         |                  |       |       |       |               |       |
| 19   | 05   |                         |                  |       |       |       |               |       |
| 19   | 10   |                         |                  |       |       |       |               |       |
| 19   | 15   |                         |                  |       |       |       |               |       |
| 19   | 20   |                         |                  |       |       |       |               |       |
| 19   | 25   |                         |                  |       |       |       |               |       |
| 19   | 30   |                         |                  |       |       |       |               |       |
| 19   | 35   |                         |                  |       |       |       |               |       |
| 19   | 40   |                         |                  |       |       |       |               |       |
| 19   | 45   |                         |                  |       |       |       |               |       |
| 19   | 50   |                         |                  |       |       |       |               |       |
| 19   | 55   |                         |                  |       |       |       |               |       |
| 20   | 00   |                         |                  |       |       |       |               |       |
| 20   | 05   |                         |                  |       |       |       |               |       |
| 20   | 10   |                         |                  |       |       |       |               |       |
| 20   | 15   |                         |                  |       |       |       |               |       |
| 20   | 20   |                         |                  |       |       |       |               |       |
| 20   | 25   |                         |                  |       |       |       |               |       |
| 20   | 30   |                         |                  |       |       |       |               |       |
| 20   | 35   |                         |                  |       |       |       |               |       |
| 20   | 40   |                         |                  |       |       |       |               |       |
| 20   | 45   |                         |                  |       |       |       |               |       |
| 20   | 50   |                         |                  |       |       |       |               |       |
| 20   | 55   |                         |                  |       |       |       |               |       |
| 21   | 00   |                         |                  |       |       |       |               |       |
| 21   | 05   |                         |                  |       |       |       |               |       |
| 21   | 10   |                         |                  |       |       |       |               |       |
| 21   | 15   |                         |                  |       |       |       |               |       |

<sup>1</sup>Viscosities by Brookfield Model LVF, at 60 r.p.m., spindle 4 (except spindle 2 for Phos-Chek 259).

<sup>2</sup>Funnel must be FULL to screen before testing begins.

<sup>3</sup>Large tip diameter should be 0.269 ±.002 inch; small tip inside diameter should be 0.187 ±.002.

- ### INSTRUCTIONS FOR USING THE MARSH FUNNEL
1. Place the appropriate tip in the Marsh Funnel.
  2. Cover the orifice with a finger and pour a freshly agitated sample into the clean, dry upright funnel until the fluid level exactly reaches the bottom of the screen.
  3. Measure the time in minutes and seconds for 1 quart of retardant to flow through the funnel (the funnel holds approximately 2 quarts).
  4. Look up measured time on left-hand side of table. Read proper column to the right to find viscosity in centipoise.
- NOTE: 1. Keep in mind that viscosity depends somewhat on the time since agitation and the temperature of the retardant. The viscosity found in the table will be for the retardant at the existing settling time and temperature.
2. For the samples tested, the Marsh Funnel method gave viscosities within 5 percent of the Brookfield method.
  3. Numbers included within the boxes indicate the normal usage range.

